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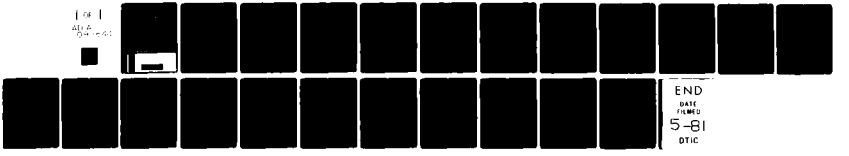

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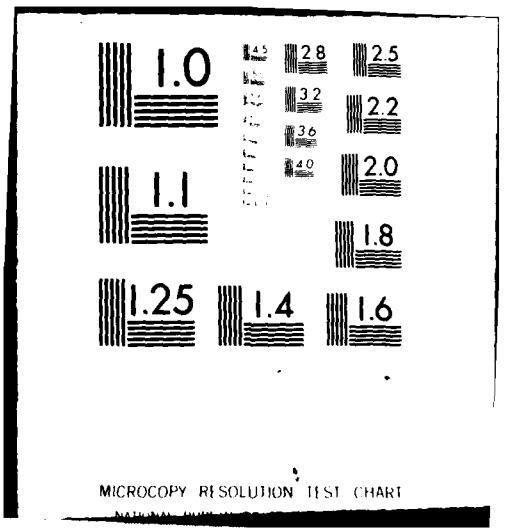
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TASK 4 REPORT
ESTIMATION OF INTERFACE DEVELOPMENT RESOURCES
WORLDWIDE CRISIS ALERTING NETWORK, PHASE II

August 1980

Prepared for
DEFENSE COMMUNICATIONS AGENCY
WASHINGTON, D.C. 20305
under Contract DCA100-80-C-0010

ARINC RESEARCH CORPORATION

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ARINC Research Corporation is developing a system architecture for the Phase II Worldwide Crisis Alerting Network (WCANII). The objective of the program is to provide communication connectivity between specified U.S. and allied military and civilian subscriber groups.

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by

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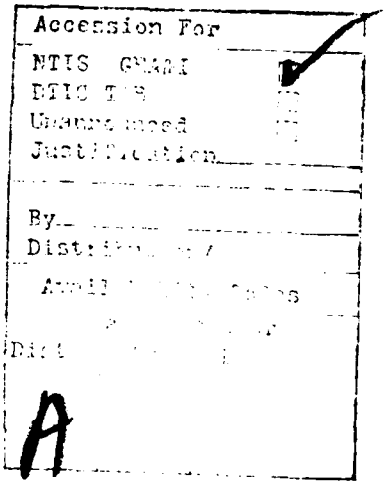
EXECUTIVE SUMMARY

This fourth task report describes the types of agreements and arrangements necessary to implement WCAN II. This report also provides a preliminary schedule and cost estimates for WCAN II implementation and maintenance. The results documented in this report are based on interviews with representatives of the subscriber groups (commercial aircraft, commercial vessels, non-DoD government agencies, U.S. offshore oil platforms and NATO).

The pertinent findings in this report are as follows:

- In the case of U.S.-based organizations and non-DoD government agencies, no formal agreements or arrangements are required, beyond the issuance of the approved procedures by normal agencies (FAA, MarAd)
- Formal agreements will be required between the U.S. and its NATO allies
- Total elapsed time from the initiation to initial operation of the WCAN II system, including NATO communications, is estimated to be 24 months
- U.S.-based organizations can be implemented in fourteen months
- The estimated total cost to implement WCAN II is $400,000
- Annual cost to maintain WCAN II including semi-annual testing is estimated to be $1,500 for additional telecommunications services and 80 manhours for government telecommunications personnel.

In summary, it appears that the time and cost to implement WCAN II are insignificant when compared to the benefits to be obtained from a worldwide crisis alerting system.



CONTENTS

CHAPTER ONE

INTRODUCTION

ARINC Research Corporation is developing a system architecture for the Phase II Worldwide Crisis Alerting Network (WCAN II) under contract DCA100-80-C-0010 for the Defense Communications Agency. The objective of the program is to identify alternative procedures and means to provide communications connectivity between specified U.S. and allied military and civilian subscriber groups. The effort encompasses the simplification and standardization of the means associated with the submission of crisis alerting messages so that they can be handled more reliably and expeditiously than is currently possible. The project will examine the telecommunications systems currently serving each subscriber group and, for each such telecommunications system, postulate interface methods and procedures. The resulting modification of interface means and procedures will permit incidents that are first recognized outside the military, to be reported quickly and efficiently to the proper authorities.

Three previous interim reports have been prepared which covered the activities associated with Task 1 (Review of Related Work), Task 2 (Identification of Existing Communications Systems), and Task 3 (Assessment of WWMCCS Interfaces). This report addresses the results of our effort on Task 4 (Estimation of Interface Development Resources).

1.1 OBJECTIVES OF TASK 4

The primary purpose of this fourth task, "Estimation of Interface Development Resources" is to determine the personnel and financial resources necessary to implement and maintain the WCAN II system. The results of this task will serve as input to Tasks 5 (Recommendation of Preferred Interface Procedures) and 6 (Development of WWMCCS Interface Implementation Concept) as well as Task 7 (Preparation of Final Report).

1.2 CONDUCT OF TASK 4

The conduct of Task 4 encompasses the performance of the three subtasks following:

- Determine Nature of Necessary Agreements and Arrangements

This subtask required discussions with representatives of selected organizations knowledgable in the five subscriber categories.

- U.S.-Maritime, Aviation and Petroleum Indistries
- NATO-Ally Maritime and Aviation Industries
- Non-DoD-U.S. Government Agencies
- NATO-Ally Government and Military Agencies
- Domestic and International Communications Common Carriers

The discussions provided basic information related to future implementation of WCAN II in the areas of economics, operational impact, safety, security/privacy, legality, and politics. As these same discussions proceeded, it was made clear that participation would be conditioned on the approval of WCAN II subscriber operating procedures. Subscriber operating procedures are those to be used by the subscriber operator for the original transmission of the crisis alerting message as well as continuing acknowledgment and responses to queries. Subscriber operating procedures are different from

the subscriber communications system/AUTODIN interface procedures addressed in this project. The development of subscriber operating procedures will be required as an early step in a WCAN II implementation project.

- Estimation of Interface Development Resources

The estimation of the resources necessary to implement WCAN II were based on discussions with the subscribers identified in the first subtask and in consideration of the interface procedures for the various subscriber communications systems described in the Task 3 report.

- Prepare Task 4 Report

This report is the result of the completion of this task. The basic information used in this task was developed in earlier tasks and supplemented by selected subscriber interviews.

1.3 ORGANIZATION OF THE REPORT

Chapter One of this report has served as an introduction to the Task 4 effort (Estimation of Interface Development Resources). Chapter Two discusses the agreements and arrangements necessary for the implementation of WCAN II by subscriber category. Chapter Three provides an estimation of the interface development resources required, together with a preliminary implementation program schedule. Finally, Chapter Four summarizes the conclusions reached as a result of performing the Task 4 effort.

CHAPTER TWO

DESCRIPTION OF NECESSARY AGREEMENTS AND ARRANGEMENTS

2.0 INTRODUCTION

This chapter describes the types of agreements and arrangements necessary for implementation of WCAN II. The agreements and arrangements described are based on interviews with selected organizations representing the various subscriber categories. In each of those interviews, the interviewer was advised that a standard set of WCAN II subscriber operating procedures would be available prior to WCAN II implementation. Hence, all the described agreements and arrangements are conditioned upon the availability of WCAN II subscriber operating procedures approved by the various subscribers.

2.1 NECESSARY AGREEMENTS AND ARRANGEMENTS, COMMERCIAL AIRLINES

2.1.1 U.S. Commercial Airlines

It appears that no formal agreements and arrangements would be required to implement WCAN II procedures with U.S. commercial airlines. The approved procedures would simply be submitted to the Federal Aviation Administration (FAA) for publication and distribution to the U.S. International Carriers.

2.1.2 NATO-Ally Commercial Airlines

Agreements and arrangements would be required with the commercial airlines of NATO allies based upon their review of preliminary procedures

made available to them for comment. There appear to be two approaches available as follows:

- Bilateral agreement between the U.S. and a specific NATO ally via that nation's Civil Aviation Authority
- NATO agreement under the Committee for European Airspace Coordination (CEAC) in DoD

The most practical approach would probably be on both levels, depending upon the desirability of early implementation. The countries with a large number of aircraft, such as the United Kingdom, Canada, West Germany, France and Italy (see Task 2 Report, Table 2-1, Page 2-3) could be approached on the basis of bilateral agreements, while at the same time approaching all of NATO via the CEAC. (CEAC meets semi-annually indicating 18 to 24 months for final agreement.) It would appear that bilateral agreements could be reached with some of the NATO countries (United Kingdom and Canada) in less than twelve months since a somewhat similar agreement [JANAP 146(E)] covering military aircraft now exists with Canada.

2.2 NECESSARY AGREEMENTS AND ARRANGEMENTS, COMMERCIAL VESSELS

2.2.1 U.S. Commercial Vessels

It appears that no formal agreement and arrangement would be required with U.S. commercial vessels to implement WCAN II procedures. The procedures would be submitted to the Maritime Administration (MarAd) for publication and distribution to U.S. vessel operators. Such distribution would include petroleum industry seismic, drill, submersible and semi-submersible vessels.

2.2.2 NATO-Ally Commercial Vessels

Agreements and arrangements would be required with the commercial vessel operators of NATO allies based upon preliminary procedures available to them for comment. There appear to be two approaches available as follows:

- Bilateral agreement between the U.S. and a specific NATO ally via that nation's Maritime Authority
- NATO agreement under the National Security Plans Office in MarAd

The most practical approach would probably be on both levels, depending upon the desirability of early implementation. The countries with a large number of vessels, such as Greece, United Kingdom, Norway and W. Germany could be approached on the basis of bilateral agreements. While Canada has relatively few flag vessels, a somewhat similar agreement [JANAP 146(E)] now exists between them and the U.S. for military vessels. It would appear logical to approach both Canada and the United Kingdom through the MarAd National Security Plans Office for near-term bilateral agreements. All of NATO could be approached for full NATO participation at the same time and through the same office. These procedures would probably require 24 months.

2.3 NECESSARY AGREEMENTS AND ARRANGEMENTS, NON-DoD-GOVERNMENT AGENCIES

2.3.1 Federal Aviation Administration

Discussions with FAA representatives indicated that no formal agreement or arrangement is required beyond the development of WCAN II operating procedures (Reference 2.1).

2.3.2 United States Coast Guard

Discussions with USCG representatives indicated that no formal agreement or arrangement is required beyond the development of WCAN II operating procedures inasmuch as they would act primarily as a communications interface between vessels and AUTODIN (Reference 2.2) and second, as a WCAN II subscriber.

2.4 NECESSARY AGREEMENTS AND ARRANGEMENTS, U.S.-OFFSHORE PETROLEUM INDUSTRY

U.S. offshore petroleum industry vessels are included in the discussion under section 2.2.1. No formal agreement or arrangement would be required for fixed offshore producing platforms. However, petroleum industry representatives have indicated interest in the review and approval of procedures by the Telecommunications Committee of the American Petroleum Institute (API).

2.5 NECESSARY AGREEMENTS AND ARRANGEMENTS, NATO

Formal agreements and arrangements will probably be required in NATO in order to include NATO communications as a WCAN II subscriber communications system. As discussed in Section 2.5, "NATO Communications Systems", in the Task 2 report, the NICS is owned jointly by all the NATO nations. The agreements and arrangements necessary will probably be more formalized than in those cases involving NATO-ally commercial aircraft and vessels. Any formal agreement would require consensus by both the civilian and military bodies of NATO.

The agreements and arrangements involving NATO will be based upon the preliminary WCAN II subscriber operating procedures. Discussions with DoD representatives indicated that both formal and informal agreement approaches would be required. The formal approach would be to have preliminary discussions with the OASD (C^3I)(Communications Systems) Office before introducing the preliminary WCAN II procedures into the NATO arena. This office is responsible for presenting new initiatives to the C^3 Working Group of the NATO Rationalization/Standardization Steering Group. The C^3 Working Group has been deeply involved with the U.S./NATO AUTODIN interface work discussed in Section 2.5.1.7, "U.S./NATO Interface Points", in the Task 2 report.

The second or informal approach would be to discuss the WCAN II preliminary subscriber operating procedures with the Office of the Director for Strategic and Theater Command and Control in OASD. This office could then discuss the WCAN II procedures informally with SHAPE and NICSMA. Informal agreements may thus be reached with the NATO military bodies in less time with this approach than with the formal approach.

It would probably be most desirable to initiate both approaches in parallel in order to assure long-term agreement.

2.6 NECESSARY AGREEMENTS AND ARRANGEMENTS, COMMUNICATIONS COMMON CARRIERS

The communications common carriers, whether domestic or international, provide a common carriage service. As a result, no formal agreement or arrangement is required with any common carrier for the handling of messages. The messages most likely to be handled by the carriers are those radioed from a ship via a commercial ship/shore station to the addressee.

Representatives of the communications common carriers have pointed out that communications could be facilitated by establishing one telephone number for voice, one TELEX number for TELEX and a registered cable address for international cables. A single AUTODIN Message Center could serve as the focal point for all three types of communications.

CHAPTER THREE

ESTIMATION OF INTERFACE DEVELOPMENT RESOURCES

3.0 INTRODUCTION

As described in Chapter Two, no formal agreements or arrangements are required for the implementation of WCAN II insofar as U.S. organizations are concerned. Formal agreements and arrangements will be required with NATO and NATO allies for their organizations. In either case, acceptability of the WCAN II concept will be conditioned upon the development of subscriber operating procedures acceptable to the subscribers.

This preliminary estimation of interface development resources presented in this chapter assumes that no additional hardware or software will be required. It should be recognized, however, that some added hardware and appropriate software might be required to improve WCAN II operational efficiency later as a result of testing and experience gained through live operation.

3.1 PRELIMINARY ESTIMATION OF INTERFACE DEVELOPMENT RESOURCES REQUIRED

This preliminary estimation of the personnel and financial resources required to implement and maintain the WCAN II system is keyed to a series of eight tasks. The scope of each task is described and the resources required are estimated. The eight tasks are as follows:

- Develop and Document WCAN II Procedures
- Brief Selected U.S. Subscriber Groups and U.S./NATO Affiliated Organizations and Obtain Subscriber Concurrence
- Draft and Submit NATO Ally Agreements and Arrangements
- Procure Necessary Telecommunications Facilities
- Install and Test Pilot System
- Finalize Procedures
- Train Subscribers and Government Personnel
- Implement and Maintain WCAN II

3.1.1 Develop and Document WCAN II Procedures

In this task detailed procedures for communicating from the message originator will be developed, reviewed with CCTC, revised as necessary and documented in draft form for review with respresentative subscriber groups.

3.1.2 Brief Selected U.S. Subscriber Groups and U.S./NATO Affiliated Organizations and Obtain Subscriber Concurrence

Briefings will be held to inform selected U.S. subscriber groups and U.S./NATO affiliated organizations in order to gain their support and participation. The draft subscriber operating procedures will be made available to those groups indicating an interest, for their review and concurrence. It is anticipated that this task would consist of two approaches: review and concurrence by U.S. subscriber groups in the near term, and review and concurrence by NATO allies over a longer term.

3.1.3 Draft and Submit NATO Ally Agreements and Arrangements

As a result of the briefings with U.S./NATO affiliated organizations described in Section 3.1.2, draft agreements and arrangements will be prepared for review and approval by those organizations. Dependent upon the particular

requirements of those organizations, procedures and schedules will be developed for obtaining concurrence by each. It is expected that considerable travel will be required in order to provide support for the project before aircraft, vessel, and NATO representatives and to obtain specific recommendations regarding the draft procedures.

3.1.4 Procure Necessary Telecommunications Facilities

It is anticipated that additional telecommunications facilities will be required at a selected AUTODIN Message Center in order to supplement those subscriber communications systems using communications common carrier services. The additional telecommunications facilities required are:

- Telephone
- TELEX
- Registered Cable Address

The telephone and TELEX facilities will require a one-time expenditure for installation and a recurring monthly charge. The Registered Cable Address requires an initial registration charge and an annual charge for continuing registration.

3.1.5 Install and Test Pilot System

Installation of a pilot system for testing the WCAN II subscriber operating and interface procedures will require some minor modifications to existing subscriber communications systems in addition to the telecommunications facilities described in Section 3.1.4. The modifications required consist primarily of the addition of a station address code to direct the messages from aircraft to the AUTODIN Message Center located at the FAA AFTN Switching Center in Kansas City. New address codes will be required for AFTN, ARINC and FAA. Upon completion of these minor modifications and

installation of the additional telecommunications facilities, the WCAN II will be ready for a pilot test.

The pilot test will allow each subscriber communications system to be tested including AFTN, ARINC and FAA for aircraft and MARISAT, USCG and commercial ship-shore radio for vessels and offshore oil platforms. Acknowledgment, query and response message tests are also contemplated. It is assumed that the initial pilot system tests will be conducted with U.S.-flag aircraft, vessels and offshore oil platforms since these subscribers could be put on-line more rapidly than NATO-ally organizations.

3.1.6 Finalize Procedures

The results of the WCAN II pilot system tests will be analyzed to determine any necessary modifications. In addition, it is to be expected that the individuals taking part in the pilot test will have suggestions regarding improvements to the WCAN II procedures. Further, it is assumed that NATO-ally organizations will also provide comments relative to the procedures, as a result of the ongoing discussions with these organizations. All comments relative to the procedures will be analyzed, reviewed with CCTC and final procedures documented. Distribution of the final procedures to U.S. organizations will be through appropriate government agencies.

3.1.7 Train Subscribers and Government Personnel

Following completion of the pilot system test and development of the finalized procedures, a training program and schedule will be developed in order to familiarize government personnel and representative subscriber organizations with the use of the WCAN II procedures. It is assumed that several briefing sessions will be required for the various subscriber organizations in both the U.S. and NATO-ally countries.

3.1.8 Implement and Maintain WCAN II

The first step in the implementation of WCAN II, after finalized procedures have been distributed and training completed, will be a test program similar to the pilot system test described in Section 3.1.5. The purpose of the tests will be to confirm that WCAN II is operational. Semi-annual testing should be a part of the ongoing system maintenance requirements and minor procedure modifications are to be anticipated.

3.2 OVERVIEW OF WCAN II IMPLEMENTATION RESOURCES REQUIRED

The resources required to implement WCAN II would include two major items -- technically competent personnel and a significant travel budget. Travel is expected to be extensive due to the need to obtain the concurrence and comments of various NATO-ally subscribers and U.S. subscribers. The WCAN II implementation resources required are summarized as follows:

. Technical Personnel	$350,000
. Travel	$ 38,000
. Telecommunications Installation and Test	$ 500

The WCAN II implementation costs for technical personnel are based on a task-by-task effort analysis and total approximately 7,000 hours at an average rate of $50 per hour. The travel costs assume the need for extensive briefing sessions in the U.S., Canada and Europe. The telecommunications installation and test costs reflect installation costs for telephone and TELEX service registration of a registered cable address and pilot test message transmission costs. The total of the implementation resources required is estimated at approximately $400,000.

The annual maintenance cost of WCAN II, assuming two tests per year, will be minimal. Annual telecommunications costs including telephone, TELEX and registered cable address will be approximately $1,500. In addition to this cost, the two tests will require about 80 hours of government telecommunications personnel.

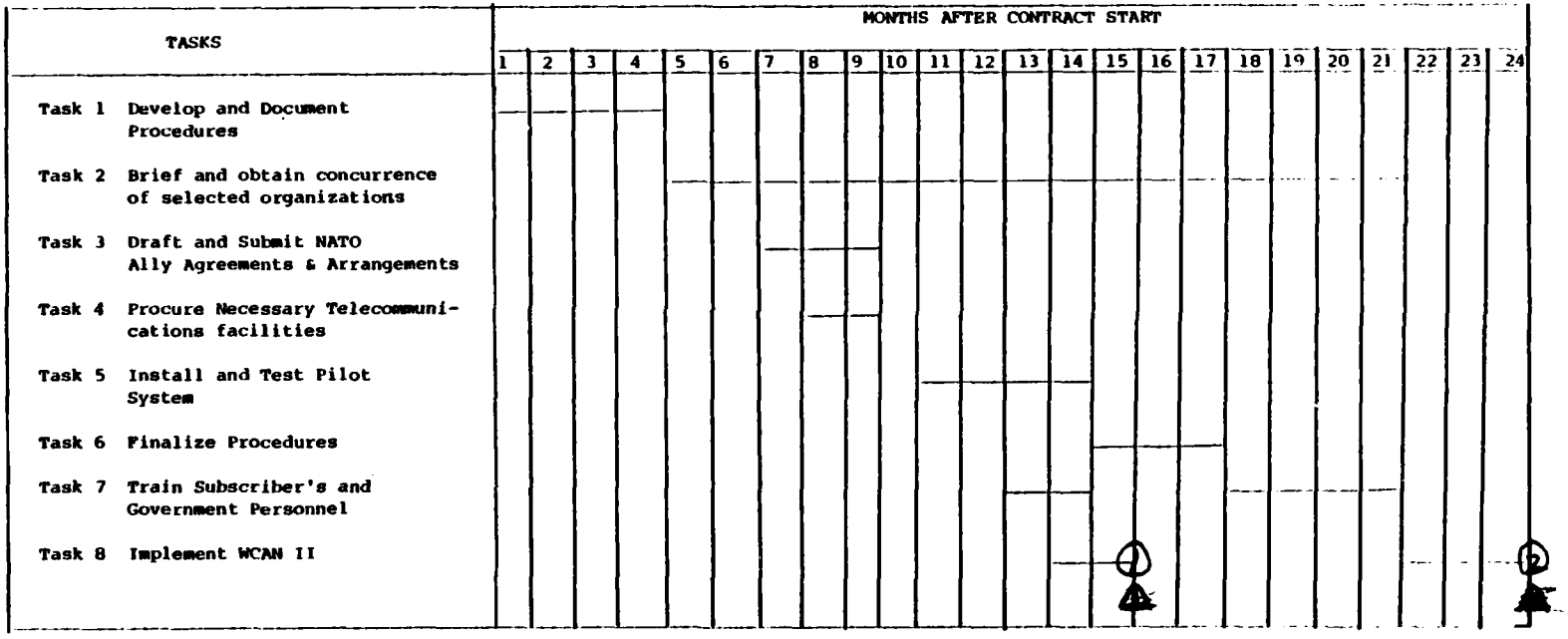
The cost for transmission of a crisis alert message from an observer will vary considerably dependent upon the location of the observer, the particular subscriber system utilized, and the type of transmission. Assuming an arbitrary message length of 150 words, the variance would range from $0 to $51.

In terms of cost effectiveness, all three costs for implementation, maintenance and message transmission appear reasonable when compared with the ability to achieve worldwide crisis reporting.

3.3 WCAN II PROCEDURE DEVELOPMENT, SYSTEM TEST AND IMPLEMENTATION SCHEDULE

The effort to implement WCAN II, as described in this chapter, will probably require an elapsed time of two years, as shown in Figure 3-1, "WCAN II Interface Procedures Implementation Schedule". The schedule shows two implementation periods (Task 8) representing early implementation for U.S. organizations and final implementation including NATO. This indicates that while an effective, yet preliminary, system could be operational at the end of fourteen months for U.S. subscriber groups, an additional ten months will be required for full implementation to include the NATO allies.

FIGURE 3-1 INTERFACE PROCEDURES SCHEDULE



(1) U.S. based organizations operational

(2) NATO allies operational

CHAPTER FOUR

CONCLUSIONS

WCAN II appears to be a very cost effective project. The system would provide worldwide reporting of crisis incidents by civilian subscribers in aircraft, vessels and offshore oil platforms utilizing existing telecommunications systems at minimal cost. The cost to implement WCAN II is estimated at approximately $400,000. Continuing system operation, assuming no hardware additions are made to AUTODIN, would cost approximately $1,500 per year. Semi-annual tests would require approximately 40 man hours per test and utilize existing telecommunications personnel.

It is difficult to conceive of a less costly method of making available the observations of highly qualified aircraft and vessel officers to enhance the gathering of information vital to the United States.

APPENDIX A

LIST OF ABBREVIATIONS AND ACRONYMS

AFTN	Airline Fixed Telecommunications Network
API	American Petroleum Institute
ARINC	Aeronautical Radio, Inc.
AUTODIN	Automatic Digital Network
C^3	Command and Control Communications
C^3I	Command and Control Communications Intelligence
CCTC	Command and Control Technical Center
CEAC	Committee of European Airspace Coordination
FAA	Federal Aviation Administration
MarAd	Maritime Administration
MARISAT	Maritime Satellite Organization
NATO	North Atlantic Treaty Organization
NICS	NATO Integrated Communications System
NICSMA	NICS Management Agency
OASD	Office of the Assistant Secretary of Defense
SHAPE	Supreme Headquarters, Allied Powers Europe
TELEX	International Teletypewriter Exchange Service
USCG	United States Coast Guard
WCAN	WWMCCS Crisis Alerting Network